

CLAIMS

What is claimed is:

1. A fixation apparatus for stabilizing a plurality of
5 bone segments comprising:

an attachment member having a top surface and a bottom
surface with a first opening formed therethrough, wherein
the first opening is defined by a sidewall;

a fastener for attaching the attachment member to at
10 least one human bone segment; and

a receiving member comprising a first aperture formed
therethrough, wherein the first aperture is defined by a
sidewall that engages at least a part of the fastener; and

wherein the receiving member is dimensioned relative to
15 the first opening of the attachment member, such that said
attachment member is connected to said receiving member in a
semiconstrained manner.

2. The fixation apparatus for stabilizing a plurality
20 of bone segments of claim 1, wherein the attachment member
further comprises a top surface, a bottom surface and a
retaining member, wherein the retaining member extends
laterally from the first opening on the top surface of said

attachment member for retaining the receiving member within said first opening.

3. The fixation apparatus for stabilizing a plurality
5 of bone segments of claim 1, wherein the attachment member further comprises a depressable retaining lip, wherein the depressable retaining lip has an upright, open position with respect to said attachment member and a pivot point, such that said depressable retaining lip may pivotally rotate
10 about the pivot point when said retaining lip depresses downwardly into a horizontal, closed position.

4. The fixation apparatus for stabilizing a plurality of bone segments of claim 1, wherein the attachment member
15 further comprises a top surface, a bottom surface and a lower rim, wherein the lower rim extends laterally from the first opening on the bottom surface to thereby support and maintain the receiving member within said first opening and preclude said receiving member from advancing completely
20 through said first opening.

5. The fixation apparatus for stabilizing a plurality of bone segments of claim 1, wherein the fastener comprises

a first portion and a second portion, wherein the second portion has a male-external threading for threaded advancement into at least one of the plurality of bone segments.

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6. The fixation apparatus for stabilizing a plurality of bone segments of claim 5, wherein the fastener further comprises a tapered exterior surface on the first portion forming a head of said fastener.

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7. The fixation apparatus for stabilizing a plurality of bone segments of claim 6, wherein the sidewall of the first aperture of the receiving member is tapered, such that the tapered exterior surface of the head of the fastener engages the tapered sidewall of the first aperture of the receiving member in a locking friction fit.

8. The fixation apparatus for stabilizing a plurality of bone segments of claim 6, wherein the head has a top surface with a recess formed therein for receiving a driving instrument.

9. The fixation apparatus for stabilizing a plurality of bone segments of claim 1, wherein the fastener comprises a first portion and a second portion, and wherein a blunt tip extends from the second portion.

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10. The fixation apparatus for stabilizing a plurality of bone segments of claim 1, wherein the receiving member has a diameter that is larger than a diameter of the first opening.

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11. The fixation apparatus for stabilizing a plurality of bone segments of claim 1, wherein the receiving member has a convex exterior surface for at least partially engaging the sidewall of the first opening of the attachment member.

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12. The fixation apparatus for stabilizing a plurality of bone segments of claim 11, wherein the sidewall of the first opening is concave, and wherein the convex exterior surface of the receiving member is smaller than the corresponding concave sidewall of said first opening, such that said receiving member may move relative to said first opening permitting micro-adjustments in said fixation

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apparatus without said receiving member exiting said first opening of the attachment member.

13. The fixation apparatus for stabilizing a plurality
5 of bone segments of claim 1, wherein the attachment member has a second opening and further has a longitudinal axis dividing a first side from a second side, wherein the first and second openings are formed between a top and bottom surface of said attachment member, and wherein said first
10 opening is formed in the first side and the second opening is formed in the second side.

14. The fixation apparatus for stabilizing a plurality of bone segments of claim 13, wherein the first and second
15 openings are circular and have a circumferential edge defining a diameter of said first and second openings.

15. The fixation apparatus for stabilizing a plurality of bone segments of claim 1, wherein the receiving member
20 comprises a geometry that relates to the first opening of the attachment member, such that said receiving member remains movable within said first opening of said attachment

member on a micro-level, thereby permitting micro-adjustments of said attachment member during settling.

16. The fixation apparatus for stabilizing a plurality
5 of bone segments of claim 1, wherein the attachment member remains movable with respect to the receiving member even after the receiving member and fastener are attached to the bone.

10 17. The fixation apparatus for stabilizing a plurality of bone segments of claim 1, wherein the fastener comprises a first portion and a second portion, and wherein an exterior surface of the first portion of the fastener and the sidewall of the receiving member engage each other
15 without substantially expanding said receiving member.

18. The fixation apparatus for stabilizing a plurality of bone segments of claim 1, wherein the receiving member has an exterior surface that defines a perimeter of the
20 receiving member, wherein the receiving member partially engages the sidewall of the first opening, such that contact between said exterior surface of said receiving member and

said sidewall of said first opening occurs around less than the entire perimeter of said receiving member.

19. The fixation apparatus for stabilizing a plurality
5 of bone segments of claim 10, wherein the diameter of the first opening is variable, such that the smallest diameter of said first opening is located at the top surface and the bottom surface of the attachment member, and wherein the largest diameter of said first opening is located near a
10 mid-section of said first opening.

20. A fixation apparatus for stabilizing a plurality of bone segments comprising:

an attachment member having a top surface and a bottom
15 surface with a first opening formed therethrough, wherein the first opening is defined by a sidewall;

a fastener for attaching the attachment member to at least one human bone segment, the fastener having a first portion and a second portion; and

20 a receiving member comprising a first aperture formed therethrough, wherein the first aperture is defined by a sidewall for engaging at least a part of the first portion of the fastener, wherein the receiving member is configured

and arranged for placement in the first opening of the attachment member; and

wherein the receiving member is dimensioned relative to the first opening of the attachment member, such that said attachment member is connected to said receiving member in a semiconstrained manner, and such that said attachment member is movable with respect to said receiving member even after the receiving member has been secured to the at least one bone segment.

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21. A fixation apparatus for stabilizing a plurality of bone segments comprising:

an attachment member having a first opening formed therethrough, said first opening being defined by a

15 sidewall;

a fastener for attaching the attachment member to at least one human bone segment, the fastener having a first portion and a second portion; and

a receiving member for connecting the fastener to the attachment member, wherein the receiving member has a first aperture formed therethrough for receiving at least a part of the first portion of the fastener therein, wherein the first aperture is defined by a sidewall, and wherein said

receiving member is configured for placement in the first opening of the attachment member;

wherein the receiving member is dimensioned relative to the first opening, such that the attachment member remains
5 movable relative to the receiving member even after said receiving member and said fastener have been secured to the at least one bone segment; and

wherein an exterior surface of the first portion of the fastener and the sidewall of the receiving member engage
10 each other without substantially expanding said receiving member.

22. A fixation apparatus for stabilizing a plurality of bone segments comprising:

15 an attachment member having a first opening formed therethrough, said first opening being defined by a concave sidewall having a first radius of curvature;

a fastener for attaching the attachment member to at least one human bone segment, wherein the fastener has a
20 first portion and a second portion; and

a receiving member having a first aperture formed therethrough for receiving at least a part of the first portion of the fastener therein, wherein the receiving

member is configured and dimensioned for placement in the first opening and has an exterior surface that comprises a second radius of curvature that is different than said first radius of curvature of said first opening of the attachment member;

wherein the difference in radii of curvature between the first radius of curvature and the second radius of curvature creates a zone of contact between the concave sidewall of the first opening and the exterior surface of the receiving member, thereby locking said receiving member to said attachment member.

23. The fixation apparatus for stabilizing a plurality of bone segments of claim 22, wherein the first portion of the fastener comprises a tapered exterior surface, and wherein the first aperture of the receiving member is defined by a tapered sidewall, such that the tapered exterior surface of the first portion of the fastener engages the tapered sidewall of the receiving member in a locking friction fit.

24. The fixation apparatus for stabilizing a plurality of bone segments of claim 22, wherein the attachment member

comprises an entrance into the first opening that is substantially circular in shape.

25. The fixation apparatus for stabilizing a plurality
5 of bone segments of claim 22, wherein the attachment member comprises at least two openings per each level of vertebrae spanned.

26. The fixation apparatus for stabilizing a plurality
10 of bone segments of claim 22, wherein the attachment member further comprises a second opening, wherein the first and second openings of the attachment member are positioned symmetrically about a longitudinal axis of the attachment member.

15 27. The fixation apparatus for stabilizing a plurality of bone segments of claim 26, wherein the first and second openings are elongated in a longitudinal direction to allow for settling or subsidence of a bone graft.

20 28. The fixation apparatus for stabilizing a plurality of bone segments of claim 26, wherein the top surface of the attachment member surrounds the first and second openings,

such that the top surface defines an entrance into each of said first and second openings, wherein a retaining lip extends from the top surface of the attachment member into a space of each of the first and second openings, such that a diameter of the entrance to the first and second openings is smaller than a diameter of the first and second openings at a location about midway between the top and bottom surface of the attachment member on the sidewall of the first and second openings.

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29. The fixation apparatus for stabilizing a plurality of bone segments of claim 22, wherein the second portion of the fastener comprises threads for advancing into and engaging bone material.

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30. The fixation apparatus for stabilizing a plurality of bone segments of claim 22, wherein the attachment member comprises a depressable retaining lip, wherein the depressable retaining lip has an upright, open position with respect to said attachment member and a pivot point, such that said depressable retaining lip may pivotally rotate about the pivot point when said retaining lip depresses downwardly into a horizontal, closed position.

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31. The fixation apparatus for stabilizing a plurality of bone segments of claim 22, wherein the attachment member further comprises a lower rim that extends laterally from the first opening on the bottom surface of the attachment member to thereby support and maintain the receiving member within said first opening and preclude said receiving member from advancing completely through said first opening.

32. The fixation apparatus for stabilizing a plurality of bone segments of claim 22, wherein the first portion of the fastener is a head that has a top surface with a recess formed therein for receiving a driving instrument.

33. The fixation apparatus for stabilizing a plurality of bone segments of claim 22, wherein a blunt tip extends from the second portion.

34. The fixation apparatus for stabilizing a plurality of bone segments of claim 22, wherein the receiving member has a diameter that is larger than a diameter of an entrance into the first opening.

35. The fixation apparatus for stabilizing a plurality of bone segments of claim 22, wherein an exterior surface of the first portion of the fastener and the sidewall of the receiving member engage each other without substantially
5 expanding said receiving member.

36. The fixation apparatus for stabilizing a plurality of bone segments of claim 22, wherein the attachment member is attached to the bone segments in a constrained manner,
10 such that there is substantially no movement between the receiving member and the attachment member once the apparatus has been completely attached to the bone.

37. A fixation apparatus for stabilizing a plurality
15 of bone segments comprising:

an attachment member having a top and bottom surface with a first opening formed therethrough;

a fastener for attaching the attachment member to at least one human bone segment, wherein the fastener comprises
20 a tapered-exterior surface; and

a receiving member having a first aperture formed therethrough for receiving at least a part of the fastener

therein, wherein the first aperture is defined by a tapered sidewall;

wherein said tapered-exterior surface of the fastener and the tapered sidewall of the receiving member are

5 configured and dimensioned to matingly engage each other without causing substantial expansion of said receiving member to thereby form a locking friction fit between said fastener and said receiving member.

10 38. The fixation apparatus for stabilizing a plurality of bone segments of claim 37, wherein said receiving member is configured and dimensioned relative to the first opening of the attachment member to remain movable within said first opening even after the attachment member is secured to the
15 at least one bone segment in a semiconstrained manner.

39. A fixation apparatus for stabilizing a plurality of bone segments comprising:

an attachment member having a first opening defined by
20 a sidewall formed therethrough;

a fastener for connecting the attachment member to at least one human bone segment; and

a receiving member comprising a first aperture defined by a sidewall, the receiving member having an exterior surface that defines a perimeter of the receiving member, wherein the sidewall of the receiving member engages at least a part of the fastener, and wherein the receiving member is configured and arranged for placement in the first opening of the attachment member; and

wherein the receiving member is dimensioned relative to the first opening of the attachment member to provide partial engagement between the exterior surface of said receiving member and the sidewall of said first opening, such that contact between said exterior surface of said receiving member and said sidewall of said first opening occurs around less than the entire perimeter of said receiving member.

40. The fixation apparatus for stabilizing a plurality of bone segments of claim 39, wherein the attachment member further comprises a top surface, a bottom surface and a retaining member, wherein the retaining member extends laterally from the first opening on the top surface of said attachment member for retaining the receiving member within said first opening.

41. The fixation apparatus for stabilizing a plurality of bone segments of claim 39, wherein the attachment member further comprises a depressable retaining lip, wherein the depressable retaining lip has an upright, open position with respect to said attachment member and a pivot point, such that said depressable retaining lip may pivotally rotate about the pivot point when said retaining lip depresses downwardly into a horizontal, closed position.

42. The fixation apparatus for stabilizing a plurality of bone segments of claim 39, wherein the attachment member further comprises a top surface, a bottom surface and a lower rim, wherein the lower rim extends laterally from the first opening on the bottom surface to thereby support and maintain the receiving member within said first opening and preclude said receiving member from advancing completely through said first opening.

43. The fixation apparatus for stabilizing a plurality of bone segments of claim 39, wherein the fastener comprises a first portion and a second portion, wherein the second portion has a male-external threading for threaded

advancement into at least one of the plurality of bone segments.

44. The fixation apparatus for stabilizing a plurality
5 of bone segments of claim 43, wherein the fastener further comprises a tapered exterior surface on the first portion forming a head of said fastener.

45. The fixation apparatus for stabilizing a plurality
10 of bone segments of claim 44, wherein the sidewall of the first aperture of the receiving member is tapered, such that the tapered exterior surface of the head of the fastener engages the tapered sidewall of the first aperture of the receiving member in a locking friction fit.

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46. The fixation apparatus for stabilizing a plurality of bone segments of claim 44, wherein the head has a top surface with a recess formed therein for receiving a driving instrument.

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47. The fixation apparatus for stabilizing a plurality of bone segments of claim 39, wherein the fastener comprises

a first portion and a second portion, and wherein a blunt tip extends from the second portion.

48. The fixation apparatus for stabilizing a plurality
5 of bone segments of claim 39, wherein the receiving member has an outer diameter at its widest point that is larger than an inner diameter of the first opening at a top surface of the attachment member.

10 49. The fixation apparatus for stabilizing a plurality of bone segments of claim 39, wherein the receiving member has a convex exterior surface for at least partially engaging the sidewall of the first opening of the attachment member.

15 50. The fixation apparatus for stabilizing a plurality of bone segments of claim 49, wherein the sidewall of the first opening is concave, and wherein the convex exterior surface of the receiving member has a diameter at its widest
20 point that is smaller than a diameter of the corresponding concave sidewall of said first opening at about a mid-point between a top and bottom surface of the attachment member, such that said receiving member may move relative to said

first opening permitting micro-adjustments in said fixation apparatus without said receiving member exiting from said first opening of the attachment member.

5 51. The fixation apparatus for stabilizing a plurality of bone segments of claim 39, wherein the attachment member has a second opening and further has a longitudinal axis dividing a first side from a second side, wherein the first and second openings are formed between a top and bottom
10 surface of said attachment member, and wherein said first opening is formed in the first side and the second opening is formed in the second side.

 52. The fixation apparatus for stabilizing a plurality
15 of bone segments of claim 51, wherein the first and second openings are circular and have a circumferential edge defining a diameter of said first and second openings.

 53. The fixation apparatus for stabilizing a plurality
20 of bone segments of claim 39, wherein the receiving member comprises a geometry that relates to the first opening of the attachment member, such that said receiving member remains movable within said first opening of said attachment

member on a micro-level, thereby permitting micro-adjustments of said attachment member during settling, even after the receiving member and the fastener have been attached to the bone.

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54. The fixation apparatus for stabilizing a plurality of bone segments of claim 39, wherein the fastener comprises a first portion and a second portion, and wherein an exterior surface of the first portion of the fastener and
10 the sidewall of the receiving member engage each other without substantially expanding said receiving member.

55. A fixation apparatus for stabilizing a plurality of bone segments comprising:

15 an attachment member having a first opening formed therethrough, wherein the first opening is defined by a sidewall;

a fastener for attaching the attachment member to at least one human bone segment; and

20 a receiving member comprising a first aperture formed therethrough, wherein the first aperture is defined by a sidewall that engages at least a part of the fastener,

wherein the receiving member is configured and arranged for placement in the first opening of the attachment member; and

wherein the receiving member is dimensioned relative to the first opening of the attachment member, such that said attachment member is movable with respect to said receiving member even after said receiving member is attached to the at least one bone segment by the fastener.

56. A fixation apparatus for stabilizing a plurality of bone segments comprising:

an attachment member having a first opening formed therethrough, wherein the first opening is defined by a sidewall;

a fastener for attaching the attachment member to at least one human bone segment; and

a receiving member comprising a first aperture formed therethrough, wherein the first aperture is defined by a sidewall that engages at least a part of the fastener, wherein the receiving member is configured and arranged for placement in the first opening of the attachment member; and

wherein the receiving member is designed to be small enough to remain movable with respect to the first opening of the attachment member, such that the receiving member is

in contact with at least a part of the sidewall of said first opening, and wherein such contact is a movable, dynamic frictional contact even after the receiving member has been attached to the bone segment.

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57. A fixation apparatus for stabilizing a plurality of bone segments comprising:

an attachment member having a first opening formed therethrough, said first opening being defined by a concave
10 sidewall;

a fastener for attaching the attachment member to at least one human bone segment, wherein the fastener has a first portion and a second portion, wherein the second portion is configured and arranged for being inserted into a
15 bone segment; and

a receiving member having a first aperture formed therethrough for receiving at least a part of the first portion of the fastener therein, wherein the receiving member is configured for placement in the first opening and
20 has a convex exterior surface;

wherein the sidewall of the first opening comprises a first curve, and wherein the exterior surface of the receiving member comprises a second curve; and

wherein the first curve is different than the second curve, such that a zone of contact is created between the concave sidewall of the first opening and the convex exterior surface of the receiving member, thereby locking
5 said receiving member to said attachment member.

58. An apparatus for restricting backout of a fastener from an elongate member after the fastener has been secured to a bone, the apparatus comprising:

10 a receiving member having a top surface, a bottom surface, and a curved outer surface connecting the top surface to the bottom surface;

a through passage formed between the top surface and the bottom surface of the receiving member, wherein the
15 through passage is defined by a sidewall; and

a lip extending at least partially inward from the sidewall of the through passage, such that the lip extends into said through passage, wherein said lip is formed at the top surface of the receiving member, such that said lip
20 defines an opening to said through passage.

59. The apparatus for restricting backout of claim 58, wherein the lip has a width dimension that is within a range

of about two percent to about ten percent of a width dimension of the receiving member at the top surface.

60. The apparatus for restricting backout of claim 59,
5 wherein the width dimension of the lip is within a range of about four percent to about eight percent.

61. The apparatus for restricting backout of claim 60,
wherein the width dimension of the lip is about five percent
10 to about six percent.

62. The apparatus for restricting backout of claim 58,
wherein the sidewall of the through passage comprises a first tapered portion and a second tapered portion.

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63. The apparatus for restricting backout of claim 62,
wherein the first tapered portion undercuts the top surface of the receiving member, to thereby form at least a portion of the lip.

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64. The apparatus for restricting backout of claim 62,
wherein the second tapered portion comprises a total

included taper angle within a range of about two degrees to about seventeen degrees.

65. The apparatus for restricting backout of claim 64,
5 wherein the total included taper angle is within a range of about four degrees to about sixteen degrees.

66. The apparatus for restricting backout of claim 62,
wherein the first tapered portion comprises a total included
10 taper angle within a range of about eight degrees to about twenty-four degrees.

67. The apparatus for restricting backout of claim 66,
wherein the total included taper angle is within a range of
15 about twelve degrees to about twenty degrees.

68. The apparatus for restricting backout of claim 67,
wherein the total included taper angle is about sixteen
degrees.

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69. The apparatus for restricting backout of claim 58,
wherein the lip further comprises a lead-in surface leading
into the opening of the through passage, wherein the lead-in

surface tapers in a proximal-to-distal direction from the top surface toward the bottom surface of the receiving member.

5 70. The apparatus for restricting backout of claim 58, wherein a substantial corner is formed at a junction between the bottom surface of the receiving member and the outer surface of said receiving member.

10 71. The apparatus for restricting backout of claim 70, wherein the corner of the receiving member is curved and comprises an edge break, such that said corner is not blunt.

 72. The apparatus for restricting backout of claim 71,
15 wherein the apparatus further comprises an elongate member having a hole defined by a sidewall formed therethrough, wherein the corner of the receiving member interferes with a portion of the hole, such that the interference maintains the receiving member in a proper orientation within the hole
20 and keeps the receiving member from flipping over itself in said hole.

73. The apparatus for restricting backout of claim 58, wherein the receiving member comprises a midline, wherein the curved outer surface of the receiving member comprises a radius of curvature, and wherein an origin of the radius of curvature is positioned below the midline on said outer surface of the receiving member, such that the origin of said radius of curvature is not centered with respect to said receiving member.

74. The apparatus for restricting backout of claim 58, wherein the receiving member comprises a first diameter and a second diameter, wherein the first diameter has a value that is less than a value of the second diameter.

75. The apparatus for restricting backout of claim 74, wherein the first diameter has a dimension that is within a range of about eighty percent to about ninety-five percent of a dimension of the second diameter.

76. The apparatus for restricting backout of claim 75, wherein the dimension of the first diameter may be within a range of about eighty-five percent to about ninety percent of the dimension of the second diameter.

77. The apparatus for restricting backout of claim 58,
wherein the lip is dimensioned such that an amount of force
required to seat the fastener in the through passage of the
receiving member is less than an amount of force required to
5 remove the fastener from said through passage of said
receiving member.

78. The apparatus for restricting backout of claim 58,
wherein the lip is formed at least partially by the top
10 surface of the receiving member.

79. The apparatus for restricting backout of claim 78,
wherein the sidewall of the through passage undercuts the
top surface of the receiving member, thereby forming a
15 bottom portion of the lip.

80. The apparatus for restricting backout of claim 58,
wherein the receiving member comprises a thickness, and the
lip comprises a thickness, wherein the thickness of said lip
20 is within a range of about five percent to about fifteen
percent of the thickness of said receiving member.

81. The apparatus for restricting backout of claim 80, wherein the thickness of the lip is about ten percent of the thickness of the receiving member.

5 82. The apparatus for restricting backout of claim 69, wherein the lead-in surface of the lip is convex.

83. The apparatus for restricting backout of claim 69, wherein the lead-in surface of the lip is linear.

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84. An apparatus for restricting backout of a fastener from an elongate member after the fastener has been secured to a bone, the apparatus comprising:

15 a receiving member having a top surface, a bottom surface, and a curved outer surface connecting the top surface to the bottom surface; and

 a through passage formed between the top surface and the bottom surface of the receiving member, wherein the through passage is defined by a sidewall;

20 wherein the receiving member comprises a midline, wherein the curved outer surface of the receiving member comprises a radius of curvature, and wherein an origin of the radius of curvature is positioned below the midline on

said outer surface of the receiving member, such that the origin of said radius of curvature is not centered with respect to said receiving member.

5 85. The apparatus for restricting backout of claim 84, wherein the receiving member further comprises a lip extending at least partially inward from the sidewall of the through passage, such that the lip extends into said through passage, wherein said lip is formed near the top surface of
10 the receiving member, such that said lip defines an opening to said through passage.

86. A fixation apparatus for stabilizing a plurality of bone segments comprising:

15 an elongate member having a first opening formed therethrough, wherein the first opening is defined by a sidewall;

 a fastener for attaching the elongate member to at least one human bone segment; and

20 a receiving member that is insertable into the first opening of the elongate member, the receiving member having a first aperture formed therethrough, wherein the first aperture is defined by a sidewall, wherein said receiving

member further comprises a lip that extends at least partially inward from the sidewall of the first aperture, such that the lip contacts at least a portion of the fastener when said fastener is seated within said first
5 aperture to thereby maintain said fastener within said first aperture;

wherein the receiving member is dimensioned relative to the first opening of the elongate member, such that said elongate member is connected to said receiving member in a
10 semiconstrained manner.

87. The fixation apparatus of claim 86, wherein the receiving member comprises a top surface and a bottom surface, wherein the lip is formed near the top surface of
15 the receiving member, such that said lip defines an opening to the first aperture.

88. The fixation apparatus of claim 86, wherein the receiving member comprises an outer surface, a top surface,
20 and a bottom surface, wherein the receiving member further comprises a substantial corner formed at a junction between the outer surface and the bottom surface.

89. The fixation apparatus of claim 88, wherein the corner is curved and comprises an edge break, such that said corner is not blunt.

5 90. The fixation apparatus of claim 89, wherein the corner comprises about a three thousandths radius.

 91. The fixation apparatus of claim 86, wherein the receiving member comprises a top surface and a bottom
10 surface, and wherein the lip has a width dimension that is within a range of about two percent to about ten percent of a width dimension of the receiving member at the top surface.

15 92. The fixation apparatus of claim 91, wherein the width dimension of the lip is within a range of about four percent to about eight percent.

 93. The fixation apparatus of claim 92, wherein the
20 width dimension of the lip is about five percent to about six percent.

94. The fixation apparatus of claim 86, wherein the sidewall of the first aperture comprises a first tapered portion and a second tapered portion.

5 95. The fixation apparatus of claim 94, wherein the receiving member comprises a top surface and a bottom surface, and wherein the first tapered portion undercuts the top surface of the receiving member, to thereby form at least a portion of the lip.

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96. The fixation apparatus of claim 94, wherein the second tapered portion comprises a total included taper angle within a range of about two degrees to about seventeen degrees.

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97. The fixation apparatus of claim 96, wherein the total included taper angle is within a range of about four degrees to about sixteen degrees.

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98. The fixation apparatus of claim 94, wherein the first tapered portion comprises a total included taper angle within a range of about eight degrees to about twenty-four degrees.

99. The fixation apparatus of claim 98, wherein the total included taper angle is within a range of about twelve degrees to about twenty degrees.

5 100. The fixation apparatus of claim 99, wherein the total included taper angle is about sixteen degrees.

10 101. The fixation apparatus of claim 86, wherein the lip defines an opening to the first aperture, wherein the lip further comprises a lead-in surface leading into the opening of the first aperture, and wherein the lead-in surface tapers in a proximal-to-distal direction from a top surface toward a bottom surface of the receiving member.

15 102. The fixation apparatus of claim 88, wherein the corner of the receiving member interferes with a portion of the first opening of the elongate member, such that the interference maintains said receiving member in a proper orientation within said first opening.

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103. The fixation apparatus of claim 88, wherein the receiving member comprises a midline, wherein the outer surface of the receiving member is curved and comprises a

radius of curvature, wherein the radius of curvature comprises an origin that is positioned below the midline on said outer surface of said receiving member, such that the origin of said radius of curvature is not centered with
5 respect to said receiving member.

104. The fixation apparatus of claim 86, wherein the receiving member comprises a first diameter and a second diameter, wherein the first diameter has a value that is
10 less than a value of the second diameter.

105. The fixation apparatus of claim 104, wherein the first diameter has a dimension that is within a range of about eighty percent to about ninety-five percent of a
15 dimension of the second diameter.

106. The fixation apparatus of claim 105, wherein the dimension of the first diameter may be within a range of about eighty-five percent to about ninety percent of the
20 dimension of the second diameter.

107. The fixation apparatus of claim 86, wherein the lip is dimensioned such that an amount of force required to

seat the fastener in the first aperture of the receiving member is less than an amount of force required to remove the fastener from said first aperture of said receiving member.

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108. The fixation apparatus of claim 86, wherein the receiving member comprises a top surface that at least partially defines a top portion of the lip of the receiving member.

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109. The fixation apparatus of claim 108, wherein the sidewall of the first aperture undercuts the top surface of the receiving member, thereby forming at least a bottom portion of the lip.

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110. The fixation apparatus of claim 86, wherein the receiving member comprises a thickness, and the lip comprises a thickness, wherein the thickness of said lip is within a range of about five percent to about fifteen percent of the thickness of said receiving member.

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111. The fixation apparatus of claim 110, wherein the thickness of the lip is about ten percent of the thickness of the receiving member.

5 112. The fixation apparatus of claim 101, wherein the lead-in surface of the lip is convex.

113. The fixation apparatus of claim 101, wherein the lead-in surface of the lip is linear.

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114. A fixation apparatus for stabilizing a plurality of bone segments comprising:

15 an elongate member having a first opening formed therethrough, wherein the first opening is defined by a sidewall;

 a fastener for attaching the elongate member to at least one human bone segment; and

20 a receiving member that is insertable into the first opening of the elongate member, wherein the receiving member comprises a first aperture and a locking means for resiliently expanding and contracting responsive to passage of a portion of the fastener through said first aperture, to

thereby secure said fastener within said first aperture in an interference fit.

115. The fixation apparatus of claim 114, wherein the
5 locking means comprises a cantilevered lip extending radially inward into the first aperture of the receiving member, to thereby define said first aperture.

116. The fixation apparatus of claim 115, wherein the
10 lip comprises a 360 degree continuous circumferential lip.

117. The fixation apparatus of claim 115, wherein the lip comprises an interrupted, discontinuous circumferential lip.

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118. A method of securing a bone fixation device onto a patient's spine, wherein the method includes:

(a) selecting an elongate member comprising a first opening and having a receiving member disposed within said
20 first opening, and locating the elongate member on the patient's spine;

(b) inserting a shaft portion of a fastener through a through passage of a receiving member until the shaft portion engages bone;

(c) advancing the fastener into the bone until a head
5 portion of the fastener engages a locking portion of the receiving member; and

(d) advancing the fastener further until the head portion thereof engages the locking portion of the receiving member, to thereby cause said locking portion to resiliently
10 expand and contract responsive to said head portion, such that said locking portion thereby operates to secure said fastener within said through passage in an interference fit.

119. The method of claim 118, wherein the locking
15 portion comprises a cantilevered lip extending radially inward into the through passage of the receiving member.

120. An apparatus for restricting backout of a fastener from an elongate member after the fastener has been
20 secured to a bone, the apparatus comprising:

a receiving member having a top surface, a bottom surface, and a curved outer surface connecting the top surface to the bottom surface;

a through passage formed between the top surface and bottom surface of the receiving member, wherein the through passage is defined by a sidewall; and

5 a lip extending at least partially inward from the sidewall of the through passage, such that the lip extends into said through passage, wherein said lip is formed as part of the top surface of the receiving member, such that said lip defines an opening to said through passage;

10 wherein the lip has a width dimension that is within a range of about two percent to about ten percent of a width dimension of the receiving member at the top surface;

wherein the sidewall of the through passage comprises a first tapered portion and a second tapered portion;

15 wherein the first tapered portion undercuts the top surface of the receiving member, to thereby form at least a portion of the lip;

wherein the first tapered portion comprises a total included taper angle within a range of about eight degrees to about twenty-four degrees;

20 wherein the second tapered portion comprises a total included taper angle within a range of about two degrees to about seventeen degrees;

wherein the lip further comprises a lead-in surface leading into the opening of the through passage, wherein the lead-in surface tapers in a proximal-to-distal direction from the top surface toward the bottom surface of the receiving member;

wherein the lead-in surface of the lip is convex;

wherein a substantial corner is formed at a junction between the bottom surface of the receiving member and the outer surface of said receiving member;

wherein the corner of the receiving member is curved and comprises an edge break, such that said corner is not blunt;

wherein the receiving member comprises a midline, wherein the curved outer surface of the receiving member comprises a radius of curvature, and wherein an origin of the radius of curvature is positioned below the midline on said outer surface of the receiving member, such that the origin of said radius of curvature is not centered with respect to said receiving member;

wherein the receiving member comprises a first diameter and a second diameter, wherein the first diameter has a value that is less than a value of the second diameter;

wherein the first diameter has a dimension that is within a range of about eighty percent to about ninety-five percent of a dimension of the second diameter;

wherein the lip is dimensioned such that an amount of
5 force required to seat the fastener in the through passage of the receiving member is less than an amount of force required to remove the fastener from said through passage of said receiving member; and

wherein the receiving member comprises a thickness, and
10 the lip comprises a thickness, wherein the thickness of said lip is within a range of about five percent to about fifteen percent of the thickness of said receiving member.